

TREATING TENDON & LIGAMENT INJURIES - THE NEW NATURAL WAY

SPECIAL REPORT by Dr Jonathan Lumsden BVSc Dip VCS MS MACVSc Dip ACVS Specialist In Surgery



Dr Jonathan Lumsden is a registered specialist in equine surgery and is the resident surgeon at the Randwick Equine Centre. His special interests are respiratory and arthroscopic surgery and lameness evaluation of racing and sport horses. His referral practice includes scintigraphic examinations as an adjunct to lameness evaluations. He has written articles, proceedings and book chapters and is a regular speaker in Australia and overseas.

Tendon and ligament injuries are common in racing and competition horses. The horses' tendons which support the lower limbs provide essential weight-bearing and more importantly provide efficient transfer of energy from muscles during exercise. As horses carry a greater percentage of weight through their forelimbs, it is not surprising that the forelimb flexor tendons, specifically the superficial digital flexor tendon, are most commonly injured during exercise. The reported incidence of tendon and ligament injury in performance horse populations range from 11% to a staggering 46%. In a recent survey of racehorses in Hong Kong tendon injury was reported as the single most common cause for a horse retiring from competition (figure 1). While there are a multitude of factors that may precipitate a tendon injury, the exact events

leading to a tendon strain are yet to be fully determined. Some of the factors identified include the horses' conformation, weight, hoof balance and shoeing, in addition to track conditions, competing distance and training regime.

Despite the current incomplete understanding of the process causing a tendon injury strain (tendonitis), increased awareness of the early clinical signs of injury, routine preventative examinations by veterinarians and improved diagnostic ultrasound capabilities have all lead to earlier diagnosis of tendon injury. Intuitively early diagnosis leads to decreased severity of injury and improved outcome with appropriate treatment. Despite this, it remains the frustration of all involved in the horse industry that tendon and ligament healing is characterised by a slow healing process and formation of scar tissue which is weaker, less elastic and more susceptible to injury. This innate inability of tendon and ligament tissue to regenerate to its' pre-injury state has led to a plethora of medical and surgical treatments over the last 50 years, none of which represent the 'silver bullet' of the 'bowed tendon'.

In the last 10 years there have been extensive efforts by human and veterinary researchers focusing on the microscopic (cellular and molecular) response of tendons following injury. This is an extremely worthwhile goal, as if we can work out exactly how the body attempts to heal injury, we can use this knowledge to design therapies that accelerate and enhance the healing process. Ultimately the goal of any therapy for tendon and ligament injury is to return of the horse to its' previous level of performance and prevent re-injury.

In response to research focusing on 'cell-based therapies', the unearthing of the powerful healing properties of

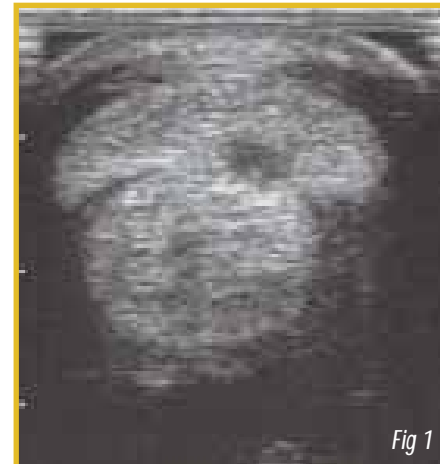


Fig 1

Ultrasound image of the flexor tendons from a horse with tendonitis following racing. The injury is represented by a loss of tendon fibres (black hole) in the superficial flexor tendon.

stem cells in man has translated to the development of similar treatments for tendon injuries in the horse. Stem cells are un specialised cells which have the unique ability to differentiate into almost any specific cell type in the body, including tendon cells (tenocytes). These undif-



Fig 2

Example of 1 of several commercial kits used for collection and preparation of platelet rich plasma (PRP) prior to injection into the injured tendon.

ferentiated 'stem cells' are found in large numbers in bone marrow and fat. 'Stem cell therapy' involves retrieval of bone marrow from the injured horse. The bone marrow, which contains a range of cells, in addition to stem cells and fluid containing growth factors is then sent to a laboratory for isolation of the stem cells and culture which then yields a massively increased number of 'stem cells' in a pure preparation. This culture process currently takes approximately 3 weeks, after which the stem cells and bone marrow serum are

RANDWICK EQUINE CENTRE

3 Jane Street, Randwick, NSW, 2031 Tel: (02) 9399 7722 www.randwickequinecentre.com.au

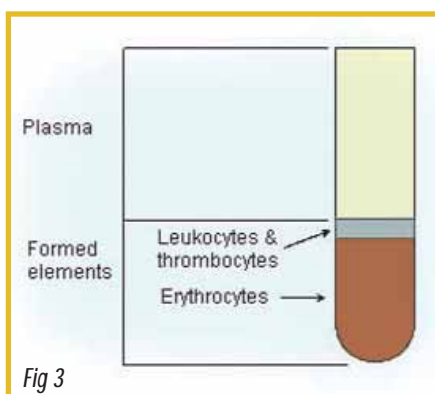


Fig 3
Diagram of the separation of components of blood that occurs following centrifugation – erythrocytes (red cells), thrombocytes (platelets)/leucocytes (white cells) and plasma.

ready for implantation into the injured tendon. 'Stem cell therapy' for the treatment of 'bowed tendons' has been increasingly used in horses for the last 3 years and initial long term follow-up is encouraging.

More recently, a wider array of 'cell-based therapies' using components of blood and the non-cellular part of bone marrow have found their way into clinical practice. The rapid introduction of such new techniques for treating tendon injuries is based on exciting laboratory research showing a positive healing effect on tendon and ligament cells.

Approximately 10 years ago a specific blood cell, the thrombocyte (platelet), best known for facilitating clotting of injured blood vessels, was also shown to accelerate healing of mouth wounds in man. Since then it has been used to enhance healing in a wide range of tissues from cardiovascular to orthopaedic conditions. The important role that platelets were found to play in wound healing arose after they were incorporated in the clot of a wound and became activated. Once activated, platelets release (degranulate) a large array of growth factors and proteins that stimulate and support healing. The platelets' positive impact on wound healing appears to be maximised in the early

stages of healing. Despite this, they have also been shown to be valuable in the treatment of chronic and slow healing wounds. In addition to the influence platelets exert on wound healing, thrombin, a protein also integral to the blood clotting process has been shown to improve the healing process both independently and through an additive effect on platelets.

The technique developed for harvesting platelets from blood provides a simple rapid sterile source of large numbers of platelets referred to as 'platelet rich plasma' or PRP. One of the great advantages of this technique is that the preparation can be collected and prepared within minutes and then injected into the injury tendon immediately.

The process involves using a specially designed system to collect blood from the injured horse (figure 2). The blood is then spun in a centrifuge to separate blood into 3 components, red cells, white cells/platelets and the plasma (Figure 3). Some systems also provide the ability for the white cells to be filtered from the platelets to yield a pure source of platelets. This small volume of highly concentrated platelets is then mixed with the horse's plasma and/or thrombin to form the PRP ready for injection. The PRP preparation is then injected into the centre of the damaged tendon under ultrasound guidance which can be performed in the standing horse (Figure 4).

To date this technique has been shown to have great promise in improving tendon healing. In research studies using injured Achilles tendons of rats, PRP was shown to result in stronger and better organised tendon healing compared to a placebo treatment. In a clinical study using PRP to treat Achilles tendon tears in man it was found that

athletes recovered from injury and returned to training faster, had better ankle movement and fewer complications.

In the last 3 years PRP has been evaluated using horse tendon and ligament cells in laboratory research studies. These experiments revealed PRP treatment improves the ability of tendon and ligament cells to produce quality collagen (type I) needed for healing that replicates the natural tendon or ligament.

Despite a paucity of definitive clinical studies to confirm efficacy of the above research, the procedure has gained widespread acceptance in the US and is now being used in Australia based on the encouraging research. A recent publication report-



Fig 4
Ultrasound guided injection into the area of damaged tendon in a horse being treated for a 'bowed tendon'.

ed on the use of PRP in the treatment of Standard bred racehorses with suspensory ligament tearing. This study found that treated horses had an excellent prognosis for returning to racing. The willingness and ability of veterinarians to apply this promising new biological therapeutic to a condition which has ended the athletic career of many horses is a unique opportunity to make a difference to a difficult condition. Although cell-based therapies for tendon and ligament injuries are in their infancy, we may be one step closer to achieving the ultimate goal of restoring a horse's performance to its' pre-injury state. **R**



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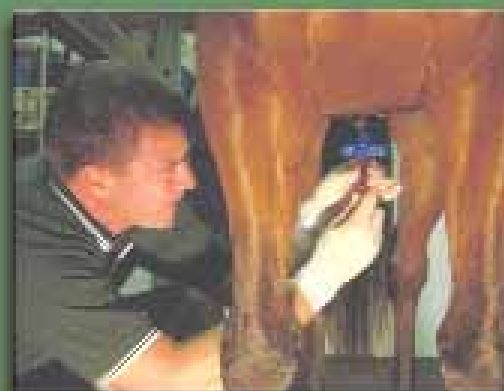
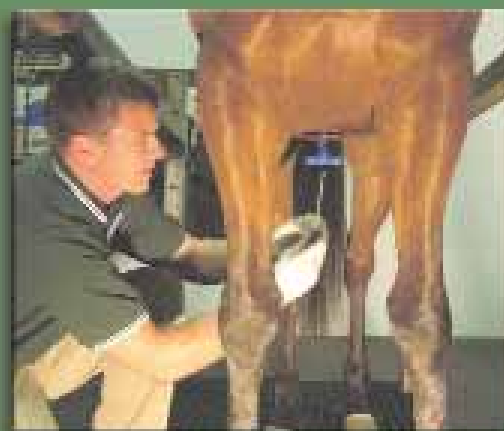
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- Stem Cell Therapy



Stem Cell Therapy is a new and still experimental treatment for tendon and ligament injuries. The process involves obtaining bone marrow from the horse's sternum (breast bone). The stem cells are harvested and grown up from the marrow and then injected under ultrasound guidance into the tendon or ligament injury.

3 Jane Street, Randwick NSW2031 PO Box 195 Randwick NSW 2031
Tel: (02) 9399 7722 Fax: (02) 9398 5649 After hours: 0417 771 733
www.randwickequine.com.au Email: REC@ava.com.au
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